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Elsøe, Katrine; Hjelm, Johan; Mogensen, Mogens Bjerg

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Electrochemical Impedance Spectroscopy as a Tool for PEMECs Development

Katrine Elsøe*[1], Johan Hjelm[1], Mogens B. Mogensen[1].

1: DTU Energy

* katel@dtu.dk

Impedance spectroscopy is a widely applied electrochemical characterization method often used for characterization of energy conversion and storage devices. This PhD project is concerned with impedance spectroscopic investigations of proton conducting electrolyte membrane electrolysis cells (PEMECs) used as a tool for further development of PEMECs. The idea is to determine internal resistance of the cell from the two electrodes, the electrolyte and of mass transport limitations by analysis of differences in impedance spectra (ADIS). This method has previously been successfully demonstrated on solid oxide fuel cells (SOFCs), and the intention is to be able to transfer the method to the PEMECs, which primarily differ from the SOFCs in the electrode reaction mechanisms and the electrodes and electrolyte materials (Nielsen and Mogensen, 2011) (Jensen et al., 2007). Furthermore, physically reasonable equivalent circuit models will be used to parameterize the observed impedance, guided by information obtained from ADIS/DRT, to provide insight into performance limiting processes in the cells.

This poster gives a brief general introduction to impedance spectroscopy followed by a discussion of the ADIS procedure and the analysis method of distribution of relaxation times (DRT). Furthermore recently recorded impedance results obtained during operation of a commercial PEMEC is presented and discussed.

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